SECTION 13 4800

SOUND, VIBRATION AND SEISMIC CONTROL

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LANL MASTER SPECIFICATION

When editing to suit Project, author shall add job-specific requirements and delete only those portions that do not apply to the Project (e.g., a component that does not apply). Contact the Engineering Standards Manual (ESM) Structural POC to seek a variance from applicable requirements. Refer to http://engstandards.lanl.gov/engrman/HTML/poc_techcom1.htm for the Engineering Standards Manual Personnel Link Index.

When assembling a specification package, include applicable specifications from all Divisions, especially Division 1, General Requirements.

Delete boldface text bounded by asterisks, and the asterisks themselves, during editing.

Brackets are used in the text to indicate author choices or locations where text must be supplied by the author.

This Section was developed solely for ML-3 / ML-4 projects, and is based on LANL ESM Chapter 5, STRUCTURAL, Section II, paragraph 2.0, DESIGN AND ANALYSIS REQUIREMENTS FOR PC-1 AND PC-2 NONSTRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES. For ML-1 / ML-2 projects, additional requirements and QA reviews are required. Refer to LANL ESM Chpt 5, Sect. III, para. 2.0 for PC-3 and PC-4 nonstructural components and non-building structures.

Many of the requirements and provisions in ESM Chpt. 5, Sect. II, para. 2.0, which are based on IBC and ASCE 7, are not included in this Section. The author is responsible for ensuring that all requirements and provisions pertaining to the Project, to include those in the reference documents, are accounted for in design, this Section, and related Sections.

Use this specification in conjunction with Sections 22 0548 and 26 0529.

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PART 1 GENERAL

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NOTE: The intent of this Section, and related Sections, is to provide for adequate resistance to lateral forces induced by earthquakes for listed architectural, mechanical, and electrical components and systems, and for nonbuilding structures, so as to preclude injury or impeded egress of personnel. In addition, this specification is intended to ensure confinement of hazardous material is maintained during and following the design seismic event in components and systems containing such material.

The design seismic lateral forces are in addition to the "normal" gravity forces (weight) acting on the components of a system, or a nonbuilding structure.

LANL will ensure the author has access to ESM Chpt. 5.

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1.1 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Refer to Section 01 4219, Reference Standards, for date of publications to follow.

1. AMERICAN CONCRETE INSTITUTE (ACI)

2. ACI 318 - Building Code Requirements for Structural Concrete

3. ACI 355.2 - Evaluating the Performance of Post-Installed Mechanical Anchors in Concrete

4. AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

5. ASCE 7 - Minimum Design Loads for Buildings and Other Structures

6. ASTM INTERNATIONAL (ASTM)

7. ASTM A 1 - Carbon Steel Tee Rails

8. ASTM A 36 - Carbon Structural Steel

9. ASTM A 53 (Rev. A) - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

10. ASTM A 153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware

11. ASTM A 500 - (Rev. A) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

12. ASTM A 563 - (Rev. A) Carbon and Alloy Steel Nuts

13. ASTM A 572 - High-Strength Low-Alloy Columbium-Vanadium Structural Steel

14. ASTM A 603 - Zinc-Coated Steel Structural Wire Rope

15. ASTM A 653 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

16. ASTM A 759 - Carbon Steel Rails

17. ASTM A 992 - (Rev. A) Structural Steel Shapes

18. ASTM F 1554 - Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

19. INTERNATIONAL CODE COUNCIL

20. (2003) International Building Code (IBC)

1.2 SYSTEM DESCRIPTION

A. General Requirements

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NOTE: Author should verify that specified details do not interfere with the performance of the cathodic protection system (when used) or of the vibration isolation systems.

Seismic protection requirements shall be in accordance with IBC, ASCE 7, and additional requirements furnished by LANL (e.g., LANL ESM Chpt. 5), and shall be provided in addition to

any other requirements called for in other Sections of these specifications.

The design for seismic protection for architectural, mechanical and electrical components shall be based on Seismic Design Category (SDC) D; short-period spectral acceleration (SD_S) = 0.54g; and the component amplification, response modification, importance factors (i.e., a_p, R_p, I_p) listed in ASCE 7.

The design for seismic protection for nonbuilding structures shall be based on Seismic Design Category (SDC) D; design spectral response acceleration at short periods (SD_S) = 0.54g; design spectral response acceleration at 1-second periods (SD_1) = 0.26g; mapped maximum considered earthquake spectral response acceleration at 1-second period (S_1) = 0.19g; and the response modification coefficients, and overstrength, deflection amplification and importance factors (i.e., a_p, R_p, I_p) listed in ASCE 7.

Resistance to lateral forces induced by earthquakes shall be accomplished without consideration of friction resulting from gravity loads.

Design the functional and physical interrelationship of components and their effect on each other so that the failure of a component or nonbuilding structure shall not cause the failure of a nearby life-safety, safety-significant, or safety class component or nonbuilding structure.

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1. The requirements for seismic protection measures described in this Section shall be applied to the mechanical components and systems outlined in Section 22 0548 MECHANICAL SEISMIC PROTECTION, the electrical components and systems outlined in Section 26 0527 HANGERS, SUPPORTS, AND SEISMIC PROTECTION, and the architectural components and nonbuilding structures listed below. Where overlap exists, the more stringent of the requirements will govern.

B. Architectural Components and Nonbuilding Structures

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NOTE: The author must ensure that the list below includes all architectural items to be braced, and the bracing for them developed in accordance with the requirements of this Section. Delete the items which are not part of the project and add items which are not included in the list.

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1. Include the following architectural components and nonbuilding structures, as well as the associated seismic protection, to the extent required on plans or in other sections of these specifications:

    a. Interior Unreinforced Masonry Walls/Partitions

    b. Parapets

    c. Stacks

    d. Exterior Unreinforced Masonry Wall Elements and Connections

    e. Suspended Acoustical Ceilings

    f. Storage Cabinets

    g. Access Floors

    h. Bridge Cranes

i. Steel Storage Racks

j. Cooling Towers

k. [_____]

1.3 COMPONENT AND SYSTEM QUALIFICATIONS

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Edit A to match project conditions; add items to list as required; delete items not included in the Project. Delete the paragraph if there are no components or systems with I_p greater than 1.0.

NOTE: Seismic protection does not guarantee that a component or system itself is rugged enough to survive earthquake shaking. When a component or system is required to remain operational after an earthquake, consult the manufacturer regarding its capabilities to withstand seismic loading.

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A. The following components and systems designated with I_p greater than 1.0 and furnished under this contract shall be certified by the manufacturer to withstand the total lateral seismic force and seismic relative displacements specified in the IBC and ASCE 7. Component manufacturer's certification shall be based on shake table testing or experience data (i.e., historical data demonstrating acceptable seismic performance), or by more rigorous analysis providing for equivalent safety. Required response spectra shall exceed 1.1 times the in-structure spectra determined in accordance with IBC AC156 Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems.

1. Interior Unreinforced Masonry Walls/Partitions
2. Parapets
3. Stacks
4. Exterior Unreinforced Masonry Wall Elements and Connections
5. Suspended Acoustical Ceilings
6. Storage Cabinets
7. Access Floors
8. Bridge Cranes
9. [_____]

1.4 QUALITY ASSURANCE

A. Provide and install architectural, mechanical, and electrical components and systems, and nonbuilding structures that conform to the requirements of the

following codes and standards:

1. IBC, Sections 1621 and 1622

2. ASCE 7, Sections 9.6 and 9.14

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Edit 1.5 to match project requirements.
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1.5 SUBMITTALS

A. Submit the following in accordance with the provisions of Section 01 3300 Submittal Procedures.

B. Catalog Data: Submit catalog data for each type of product specified. Include information substantiating equivalent corrosion resistance to zinc coated steel of alternative treatment, finish, or inherent material characteristic.

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Edit C to match project conditions; delete if not required by Project.
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C. Certifications: Submit manufacturer's certification of compliance indicating compliance with Clause 9.6.3.6 of ASCE 7 for architectural components with I_p greater than 1.0. Submit shake-table test results or experience data with certifications.

PART 2 PRODUCTS

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NOTE: In corrosive environments, appropriate materials for structural supports must be used. Dissimilar metals must be isolated.
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2.1 SUBSTITUTIONS

A. Alternate products may be accepted; follow Section 01 2500, Substitution Procedures.

B. As is the case with all LANL projects, substitutions are permitted unless noted otherwise; however, "approved equal" non-building structures and seismically protected non-structural components must be reviewed and approved by the design structural engineer.

2.2 BOLTS

A. Squarehead and hexhead bolts, ASTM F 1554, Gr. 36 or [ASTM A 325]; and heavy hexagon nuts, ASTM A 563.

B. Bolts and nuts used underground and/or exposed to weather shall be galvanized in accordance with ASTM A 153.

C. Crane rails, ASTM A 759, ASTM A 1, and/or [manufacturer's specifications]

2.3 SWAY BRACING

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NOTE: Author should determine an appropriate specification for steel angles used for sway bracing depending on availability of the materials from local suppliers and insert the designation in blank space below.

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A. Material used for members listed [in this Section] [and] [on the Drawings], shall be structural steel conforming with the following:

1. Plates, rods, and rolled shapes, [ASTM A 36] [ASTM A 992] [ASTM A 572, Gr. 55].

2. Wire rope, ASTM A 603.

3. Tubes, ASTM A 500, Grade [B] [_____].

4. Pipes, ASTM A 53, Type [E] or [S], Grade B.

5. Light gauge angles, less than ¼-inch thickness, [ASTM A 653] [_____].

PART 3 EXECUTION

3.1 GENERAL

A. Install architectural, mechanical, and electrical components and systems, and nonbuilding structures, as shown, and in accordance with the requirements in this and related Sections, and manufacturer's instructions and recommendations.

B. Seismic protection measures like guy wires, wire rope, etc. shall be installed such that they are taught (i.e., without slack) when the component/system/nonbuilding structure they are protecting is 'at rest.'

3.2 EXAMINATION

A. Examine surfaces to receive seismic protection for compliance with installation tolerances and other conditions affecting performance of the system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 BRACING

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NOTE: Designs must include complete seismic details showing bracing requirements. In the case of an architectural, mechanical, or electrical component/system, the design is for the supports of the component/system, not the component/system itself. Bracing does not guarantee that the component/system is rugged enough to survive earthquake shaking. When

a component/system is required to remain operational after an earthquake, the manufacturer should be consulted regarding its capabilities to withstand seismic loading in accordance with ASCE 7.
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A. Bracing shall conform to the arrangements shown.

3.4 FASTENING

A. Unless otherwise indicated, fasten architectural, mechanical and electrical components and their supporting hardware securely to the building structure.

B. Select each fastener so that the load applied to the fastener does not exceed the manufacturer's recommended load for the fastener.

C. Powder driven fasteners shall not be used for tension load applications unless approved by LANL.

D. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

3.5 ANCHOR BOLTS

A. Refer to Section 03 1505 Concrete Anchors.

3.6 EQUIPMENT SWAY BRACING

A. Suspended Equipment

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NOTE: Equipment weighing more than one-fifth of the dead load of slabs above grade at the equipment level, or equipment weighing more than one-tenth of the building weight must be checked by structural analysis to conform with building seismic provisions. Such equipment has a pronounced effect on the response of the building.

The author shall provide (1) braces for equipment as required by ASCE 7, and (2) for approval, the associated calculations and details of bracing.

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1. Equipment sway bracing shall be provided and installed for items supported from overhead floor or roof structural systems.

2. Braces shall consist of angles, rods, wire rope, bars, or pipes arranged as shown and secured at both ends as shown.

B. Floor- or Pad-Mounted Equipment

1. Floor-/pad-mounted equipment shall be bolted to the floor/pad as shown.

3.7 OTHER COMPONENTS AND NONBUILDING STRUCTURES

A. Provide and install the following specific components and nonbuilding structures

to be furnished under this contract as shown on drawings.

1. Interior Unreinforced Masonry Walls/Partitions
2. Parapets
3. Stacks
4. Exterior Unreinforced Masonry Wall Elements and Connections
5. Suspended Acoustical Ceilings
6. Storage Cabinets
7. Access Floors
8. Bridge Cranes
9. Steel Storage Racks
10. Cooling Towers
11. [_____]

3.8 SPECIAL INSPECTION AND TESTING FOR SEISMIC-RESISTING SYSTEMS

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NOTE: Include this paragraph only when special inspection and testing for seismic-resisting systems is required by IBC, ASCE 7, and/or LANL ESM Chapter 5.

This paragraph will be applicable to both new buildings and to existing building repair/alteration/addition designs.

The author must indicate on the drawings all locations and all features for which special inspection and testing is required. This includes indicating the locations of all structural components and connections, and nonbuilding structures, requiring inspection.

Add any additional requirements as necessary.

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A. Special inspections and testing for seismic-resisting systems, components and nonbuilding structures shall be done in accordance with [_____].

END OF SECTION

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Do not delete the following reference information.

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FOR LANL USE ONLY

This project specification is based on LANL Master Specification13 4800 Rev. 0, January 6, 2006.